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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/923,834	08/07/2001	Robert F. Darveaux	M-10966 US	1262

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EXAMINER
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ERDEM, FAZLI

ART UNIT	PAPER NUMBER
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2826

DATE MAILED: 01/12/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 09/923,834	Applicant(s) DARVEAUX ET AL.	
	Examiner Fazli Erdem	Art Unit 2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 27 October 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-8, 10-17, 19, 20, 22-47 and 50-55 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-8, 10, 12-17, 19, 20, 22-27, 29-32, 34-40, 42-47 and 50-55 is/are rejected.
- 7) ☒ Claim(s) 11, 28, 33 and 41 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Examiner's Comment***

1. Should the applicant have any questions regarding office action below, he/she is urged to contact the examiner and request either a telephonic or in-person interview. Examiner is readily available for either type of interview. Examiner's phone number is listed in the bottom of this office action.

### ***Allowable Subject Matter***

1. Claims 11, 28, 33, 41 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

### ***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-7, 10, 12-16, 19, 20, 22-27, 29-32, 34-40, 42-44, 46 and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. (5,977,626) in view of Khan et al. (6,853,070).

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Regarding Claim 1, 16, 20, 23, 27, 29-32, 37-40, 42-44, 46 and 47 Wang et al. disclose a thermally and electrically enhanced PBGA package where in Figs. 2-5, it is disclosed substrate 20 having a first and a second surface, a die 22 having a first surface and a second surface wherein the first surface of the die is attached to the first surface of the substrate, a heat spreader 32 attached to the second surface of the die wherein the heat spreader comprises an interior planar portion 32b overlying and attached to the die, an outer planar portion 32a overlying and attached to at least a portion of the substrate 20, a first angled portion extending from the outer planar portion 32a towards the second surface of the die.

Wang et al. does not specifically state that both the heat spreader and the die is completely encapsulated by encapsulant 30, The Figs 2-5 clearly show that aside from the top portion of the heat spreader encapsulant 30 completely covers the heat spreader and the die. However, Khan et al. disclose a die-down ball grid array package with die attached to heat spreader and method of making the same where in Fig. 2A, heat spreader and the die combination is completely covered with encapsulant 116.

It would have been obvious to one of having ordinary skill in the art at the time the invention was made to include the required encapsulation in Wang et al. as taught by Khan et al. in order to have a semiconductor package with increased reliability.

Regarding Claims 2, 12, 36, Figs 2-5 of Wang et al. show that the second/first surface of the die is the active side of the die.

Regarding Claims 3, 4, 13, 14, 25, 26 Fig. 2-5 of Wang et al. show that second/first surface of the die is electrically coupled to the first surface of the substrate via bondwires 26b

Regarding Claim 5, in Figs 2-5 of Wang et al., conductive ball grid array 28 is coupled to the second surface of the substrate.

Regarding Claim 6, 8, 15, 16, 19,22 Figs. 2-5 of Wang et al. show that a thin layer of thermal conductive adhesive is present between the die and the heat spreader.

Regarding Claim 10, outer portion 32a overlies only a portion of the substrate .

Regarding Claim 34, Figs. 2-5 of Wang et al. show rings 20a-20e

Regarding Claim 35, Khan et al. disclose a flip chip type packaging.

3. Claims 8,17,45 and 50-55 rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. (5,977,626) in view of Khan et al. (6,853,070) further in view of Burns (5,566,051)

Regarding Claim 8,17, 45 and 50-55, Wang et al. disclose a thermally and electrically enhanced PBGA package where in Figs. 2-5, it is disclosed substrate 20 having a first and a second surface, a die 22 having a first surface and a second surface wherein the first surface of the die is attached to the first surface of the substrate, a heat spreader 32 attached to the second surface of the die wherein the heat spreader comprises an interior planar portion 32b overlying and attached to the die, an outer planar portion 32a overlying and attached to at least a portion of the substrate 20, a first angled portion extending from the outer planar portion 32a towards the second surface of the die.

Wang et al. does not specifically state that both the heat spreader and the die is completely encapsulated by encapsulant 30 and the required thickness requirement. The Figs 2-5 clearly show that aside from the top portion of the heat spreader encapsulant 30 completely

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covers the heat spreader and the die. However, Khan et al. disclose a die-down ball grid array package with die attached to heat spreader and method of making the same where in Fig. 2A, heat spreader and the die combination is completely covered with encapsulant 116. Furthermore, Burns disclose ultra-high density integrated circuit packages method and apparatus where in claims 4,5,6, 8 and 13, the required thicknesses of approximately 9 mils and less than 9 mils are disclosed.

It would have been obvious to one of having ordinary skill in the art at the time the invention was made to include the required encapsulation and the thickness in Wang et al. as taught by Khan et al. and Burns, respectively, in order to have a semiconductor package with increased reliability.

### *Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fazli Erdem whose telephone number is (571) 272-1914. The examiner can normally be reached on M - F 8:00 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on (571) 272-1915. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

FE

January 9, 2006

  
NATHAN J. FLYNN  
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